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D & D Best Practices Demolition of a Research Facility Building 431

W. L. Collins

October 3, 2005

EFCOG Infrastructure Management Working Group
Livermore, CA, United States
October 4, 2005 through October 6, 2005

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D&D Best Practices
Demolition of a Research Facility
Building 431

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EFCOG – Infrastructure Management Working Group
October 4-6, 2005

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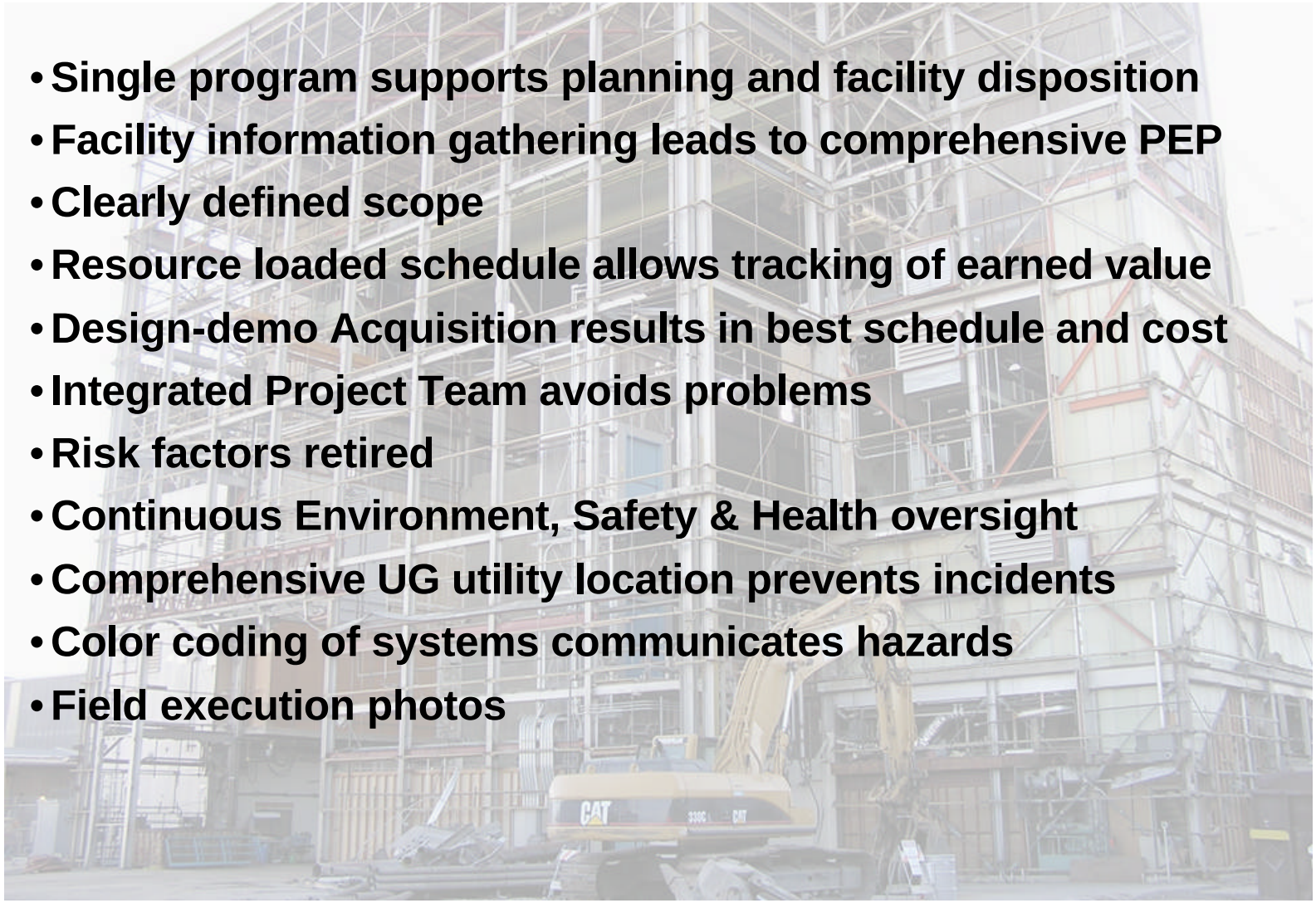
Overview of best practices



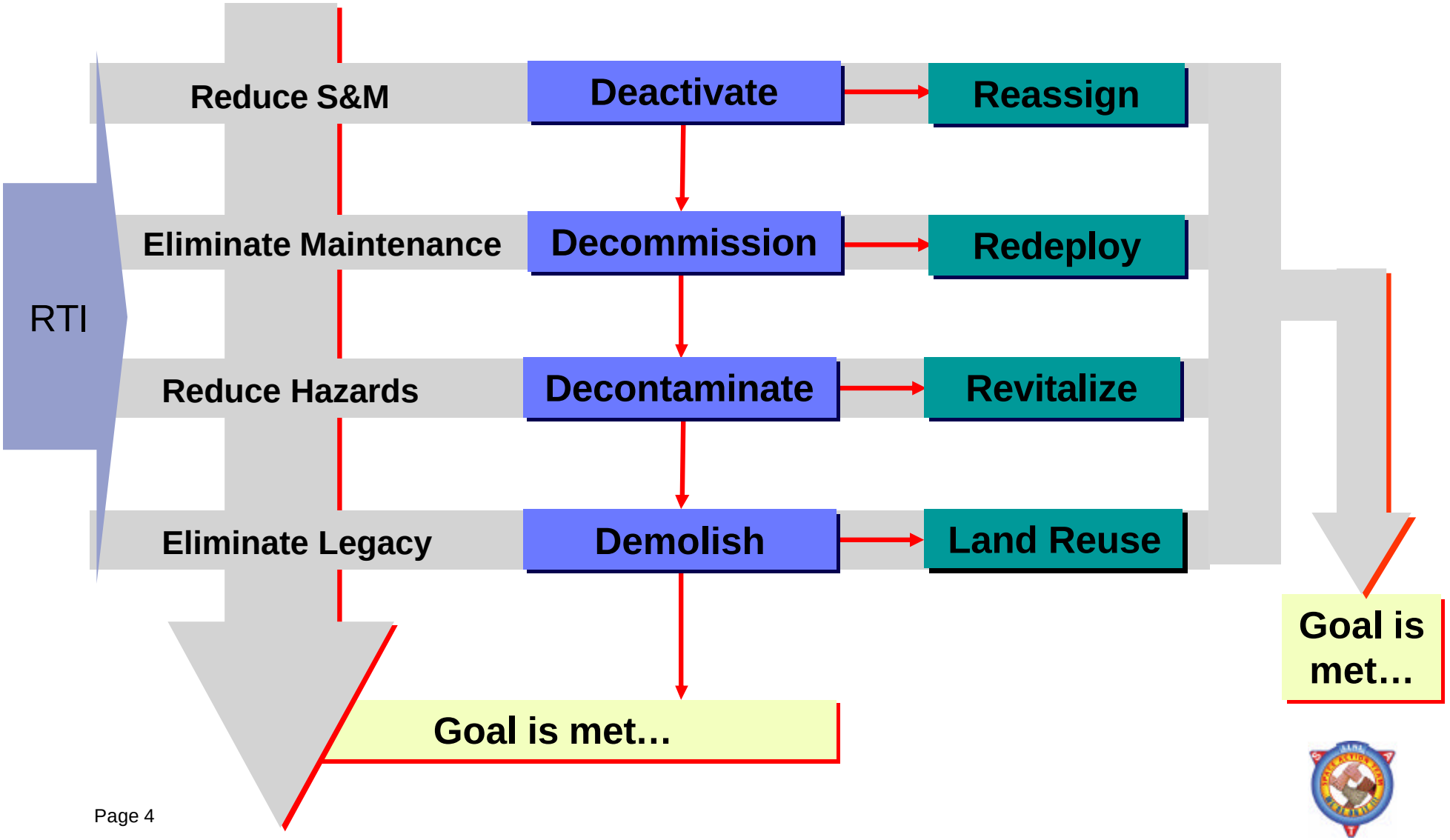
- Single program supports planning and facility disposition
- Facility information gathering leads to comprehensive PEP
- Clearly defined scope
- Resource loaded schedule allows tracking of earned value
- Design-demo Acquisition results in best schedule and cost
- Integrated Project Team avoids problems
- Risk factors retired
- Continuous Environment, Safety & Health oversight
- Comprehensive UG utility location prevents incidents
- Color coding of systems communicates hazards
- Field execution photos

Facility disposition supports strategic objectives

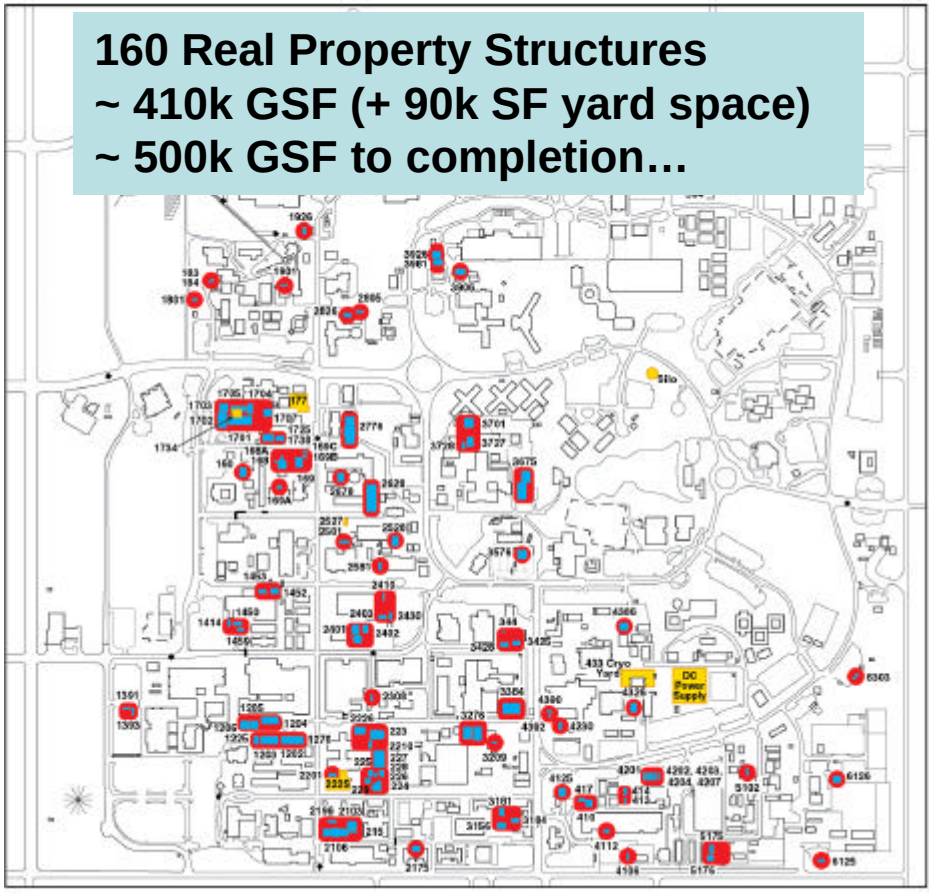
One Integrated Program for both Institutional S&M and D&D

1. **Provide facility management for buildings that are surplus or excess to Program needs.**
   - **Manage the process to transition facilities from an operating condition into an inactive status**
2. **Plan and execute facility disposition in support of strategic objectives.**
   - **The Space Action Team (SAT) is an integrated multi-disciplinary, multi-directorate, cross-trained team with diverse talents and skills dedicated to execute facility projects**
3. **This approach increases flexibility and value**
   - **Supports programs through relief of unneeded facilities**
   - **Provides flexibility in establishing project priorities**
   - **Utilizes S&M as a precursor to disposition**
   - **Establishes a balance to optimize utilization of surplus facilities**

The Laboratory's flexible approach to manage its disposition program begins with the end in mind



Stabilizing & Removing Excess/Surplus Facilities is a Key Element to Strategic Facility Planning

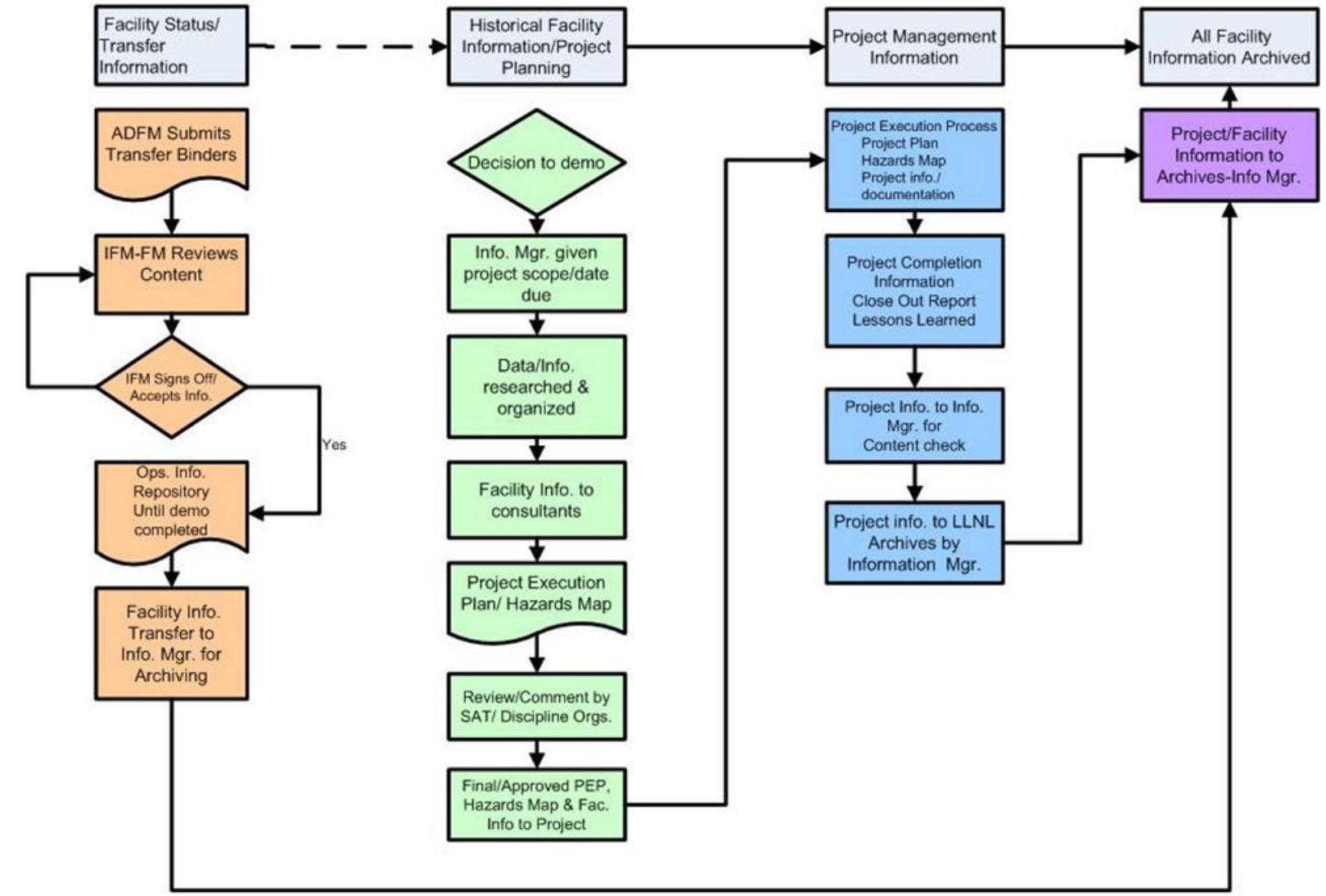


- Single program responsibility supports “Dual Purpose” planning
- Provides a framework for decision making and priority setting
- Supports “End Point Planning” starting at initiation of transfer
- B431 is a good example of this efficiency

Institution “owns” 50 buildings, ~800k SF excess/re-assignable space.

Recycle stats:
Concrete – 22,000 Tons
Metal – 2,400 Tons
Freon – 1,300 lbs
Wood – 180 CY

Facility information process for D&D



Historical Search Table of Contents

Facility

- Master Equipment List (MEL)
- Phone and networks
- Asbestos
- High pressure data base
- Key plans
- Facility number changes
- Maintenance backlog
- Deficiencies
- Facility photos
- Historical Site Maps
- FIMS

General

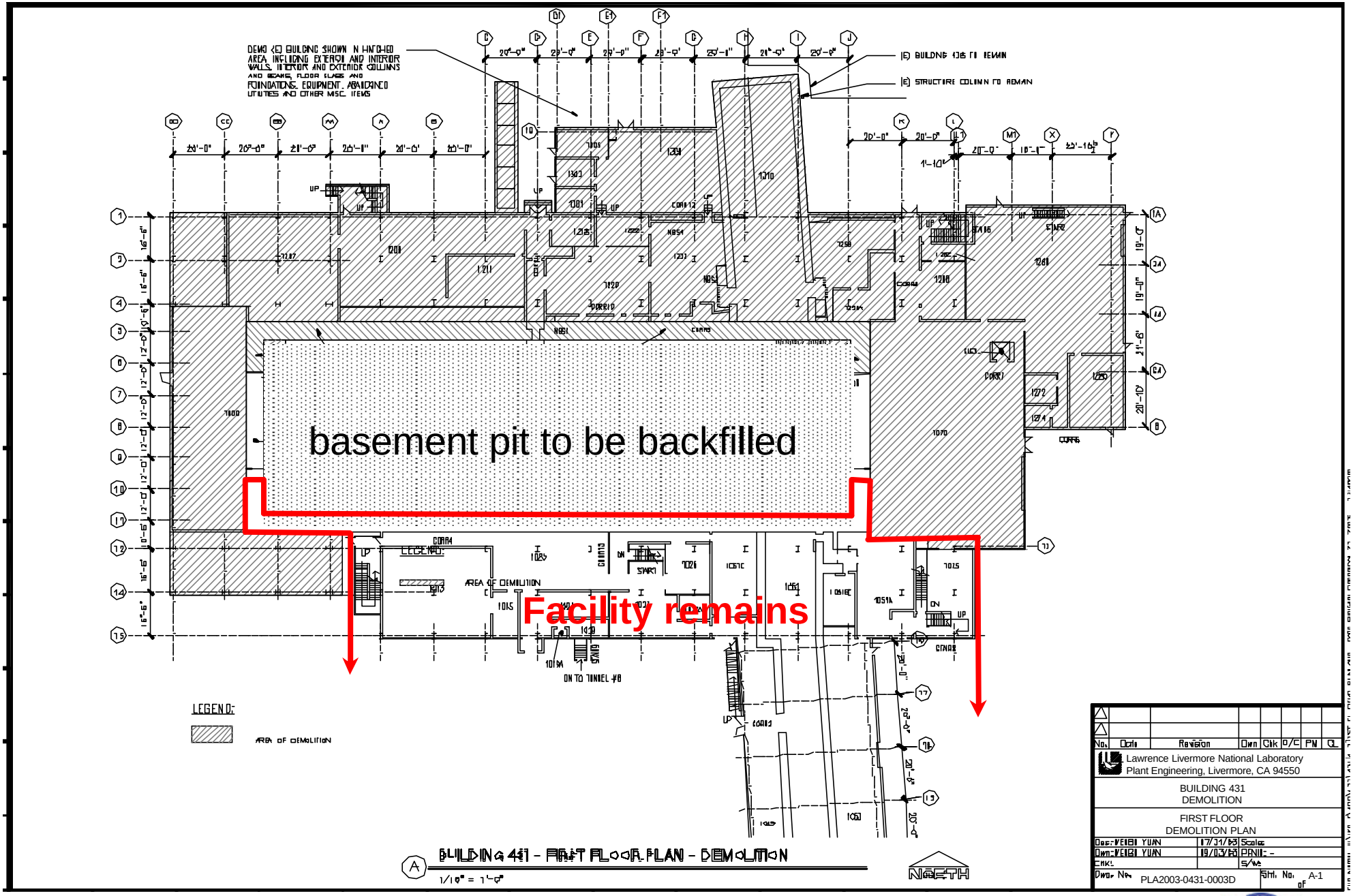
- Personal Interviews
- E-mails
- IAs and ORs
- Sunflower Report
- Archives
- Security
- Store Room
- Financial Records

Environmental & Hazards

- Drain Reports
- EPD file review
- Chem track
- Spill Reports
- Environmental Permits
- SWPPP
- Retention Tank Reports
- Waste Records
- NEPA/NHPA
- Screening report/H.A.R.
- Facility Haz. Class
- H. C. Team facility files
- Fire Dept. files
- RAD Survey 10 CFR 835
- HEPA filter data base

The facility status and historical data supports a successful PEP and is archived with a project closeout report.

- **Constructed 1950**
- **Material Test Accelerator program**
- **Mirror Fusion Test Facility**
- **ETA-II, a non-nuclear facility, remains operational**


basement pit to be backfilled
Facility remains
DEMO (E) BUILDING SHOWN IN HATCHED AREA, INCLUDING EXTERIOR AND INTERIOR WALLS, INTERIOR AND EXTERIOR COLUMNS AND BEAMS, FLOOR SLABS AND FOUNDATIONS, EQUIPMENT, ABANDONED UTILITIES AND OTHER MISC. ITEMS
(E) BUILDING ITEMS TO REMAIN
(E) STRUCTURE COLUMN TO REMAIN
LEGEND:
AREA OF DEMOLITION
BUILDING 431 - FIRST FLOOR PLAN - DEMOLITION
1/16" = 1'-0"
NORTH
Lawrence Livermore National Laboratory
Plant Engineering, Livermore, CA 94550
BUILDING 431
DEMOLITION
FIRST FLOOR
DEMOLITION PLAN
Dwg. No. PLA2003-0431-0003D
Sht. No. A-1

Scope of work

- Isolation and reroute of utilities to minimize neighborhood impact
  - Temporary re-routing of 13.8 KV circuit and removal inside pit
  - Replace transformer and re-route main feeders to ETA
  - Reroute elec circuits and piping feeding nearby buildings
- Remove concrete shield block (35T) Depleted Uranium target wall
- Abate Asbestos Containing Material (e.g., exterior siding, flooring, lead paint, thermal system insulation, etc.)
- Remove and dispose of interior and exterior equipment
- Demolish steel structure – 100’ hibay roof, 50T crane, 4 story structure
- Demolish North concrete shield wall and foundation to grade level
- Backfill pit
- Rebuild and weatherproof South roof and siding

Alternatives evaluated and various reviews conducted throughout the life of a project.


CAT
WACKER

Management systems, controls and planning

- **Once Authorized, the Integrated Project Team plans, manages and controls the project using a tailored approach of DOE Order 413.3 and the Project Management Manual, DOE M413.3-1.**
- **The LLNL Space Action Team has management responsibility for the day-to-day work execution**
- **Implementing documents**
  - **NNSA FIRP(1) Program Execution Plan**
  - **LLNL FIRP Program Management Plan**
  - **LLNL ISMS Implementation Plan**
  - **Building 431 Project Execution Plan**
- **Special project reviews**
  - **Independent Project Review at Critical Decision 0**
  - **External Independent Review at Critical Decision 1/2/3**
  - **Value Engineering "Red Team" led by a certified Project Management Professional (PMP)**
- **Resource loaded schedule used to track work scheduled and performed, and compared to actual costs to establish monthly earned value**
- **Monthly schedule and cost performance is tracked at Division Level (WBS Level 2) and reported externally to NNSA at Level 1**
- **NNSA Livermore Site Office (LSO) oversight**

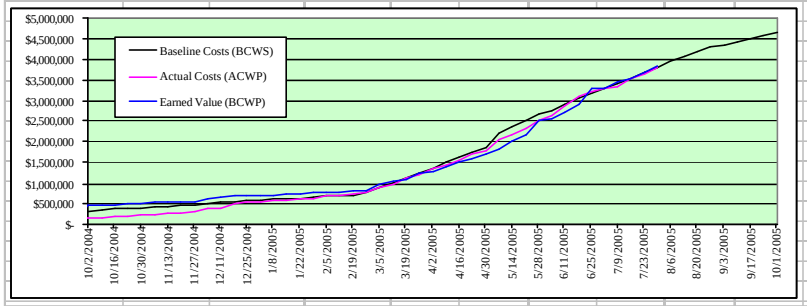
CD - 0 Mission Need – Plan & Prep
CD - 1 Alternative Selection – "DEMOLITION"
CD - 2 Performance Baseline - "TPC $12M, Completion Nov. 2006"
CD - 3 Begin Field Demolition Activities
CD - 4 Project Completion and Closeout

Good communication eliminates surprises.

Project performance reporting

Building 431

Data Thru	ACWP ($k)	BCWS ($k)	BCWP ($k)	CV ($k)	CV (%)	CPI	SV ($k)	SV (%)	SPI
7/30/2005	3,812	3,821	3,830	18	0.48%	1.005	9	0.25%	1.002
6/25/2005	3,218	3,183	3,284	66	2.01%	1.020	101	3.18%	1.032



Project Start: 8/4/03 | Project End: 7/21/06
Act. Proj. Start: 8/4/03 | Act. Proj. End:

Authorized Funding to Date ($k):	$ 8256
Project Budget w/ Contingency ($k):	$ 12038
Project Budget w/o Contingency ($k):	$ 9361
Estimate to Complete (ETC) ($k):	$ 5531
Remaining Budget ($k):	$ 8226
Variance at Completion ($k):	$ 2695
Contingency Budget ($k):	$ 2677
Contingency Remaining ($k):	$ 2677

Variance CPI/SPI Color Key	
	<.85
	.85-.90
	>.90

Cost Variance Detail: **1.00**

Cost variance satisfactory. Value represents slightly lower than expected costs for preparation and procurement activities.

Cost Variance Recovery Plan:

None required.

Schedule Variance Detail: **1.00**

Schedule variance satisfactory. Two week late finish of utility deactivation and late start of demolition contractor offset by CES sampling approximately $80k ahead of plan.

Schedule Variance Recovery Plan:

None required.

Highlights and Lowlights

- LO/GSE utility deactivation contractor substantially complete at 96%; life safety systems and punchlist remaining in Aug and temp power removal in Sep.
- ETA major electrical outage for refeed of power successfully completed; ETA equipment back on-line.
- Continued site support activities: sampling of concrete for recycle and oil for waste disposal.
- Completed review of demolition subcontract (Evans Brothers Inc.) submitals; resubmit some items in response to comments.
- Abatement/Demo NTP granted July 21; EBI/Bayview mobilized July 28 and began abatement preparations.
- Abatement activities were started in July on removal of Galbestos siding. [Abatement Start Milestone]
- Two transforms with PCB oil need processed as hazardous waste; other oil needs pumped by approved waste hauler.
- Superblock security camera installation complete and cameras deactivated and removed from B431.
- NNSA granted approval for 48 property items to be disposed by the demo subcontractor; tags have been removed.
- Specs and procurement package for roof/wall restoration being delayed to review high construction estimate and evaluate alternate go-forward plan; no impact on critical path.
- Perspective of Roof Restoration completed.
- B431 SCR (describing two segments) has been signed by the AB group and PAT ADFM, then submitted to LSO for formal review.
- Developed Critical Lift Plan for removal of Depleted Uranium Shield Block. Final approval expected in September to execute work.

Safety Minute

- Deactivation of all mechanical and electrical systems complete (except Life Safety) in preparation for demo.
- Some final color coding still needs worked by H&ST and Construction Inspector.

Key Milestones

Utility Deactivation Start	Jan-05	✓
Award Demolition Contract Start	May-05	✓
Abatement Start	Jul-05	✓
Demolition Start	Sep-05	
CD-4 Projcet Complete	Nov-06	

Several reports help monitor performance.

Acquisition Strategy

- Finalized after CD-0 and submitted per DOE M 413.3-1
- Combination of LLNL staff and competitive fixed-price procurements awarded by the University of California. Assumptions:
  - LLNL staff handles prep work, sampling, hazardous waste disposal, ES&H oversight and PM
  - LLNL Labor-only contractor (Davis-Bacon) performs utility isolation and re-routing
  - Design-demolition ("Design / Unbuild") subcontract awarded hazards abatement, demolition, backfill, and site grading. Experience & safety record essential.
  - Design-build subcontract will be awarded for weatherproofing and repair/rebuild of the remaining roofing and siding.
- Detailed design-demolition specifications and detailed utility deactivation drawings and procedures prepared
- Design-demo subcontract strategy resulted in several different demolition approaches
  - Best value bid uses method not originally considered
  - Recycle value $250k and 85% of materials
- Best value evaluation: license & certifications, security, vibration, traffic, recycle, schedule, safety history (ERR & TRR), shield wall demo, similar projects, references and price.

Design-demo process results in best schedule and cost.

Integrated project team (IPT) involvement

- ETA-II, a non-nuclear facility, remains operational and continues experiments
- Computations server facility and archive records management facility B439
- High voltage routing through existing building
- Machine shop services facility B432
- Operational Security Plan due to the proximity to security area
  - Vehicle and personnel access
  - Staging of material and equipment
  - Restrictions on crane size, placement, accessibility and relocation
  - Security related work stoppages may impact the project
- ES&H Teams
- Representative personnel are on the project review team

IPT participation avoids problems during execution.

Risk and Contingency Management

- **Risk Management Plan developed, risk assessment completed and a risk mitigation strategy prepared.**
- **The activities with the highest risks are Electrical & Mechanical Isolation, shield wall removal and Renovation.**
- **The high risk factors include:**
  - **Encountering stored energy**
  - **ETA II sensitivity to vibration**
  - **Difficulty with demolition of the shield wall due to its size**
  - **Schedule uncertainty due to uniqueness of shield wall demo, potential weather delays, impacts to nearby operational facilities, ETA operational status**

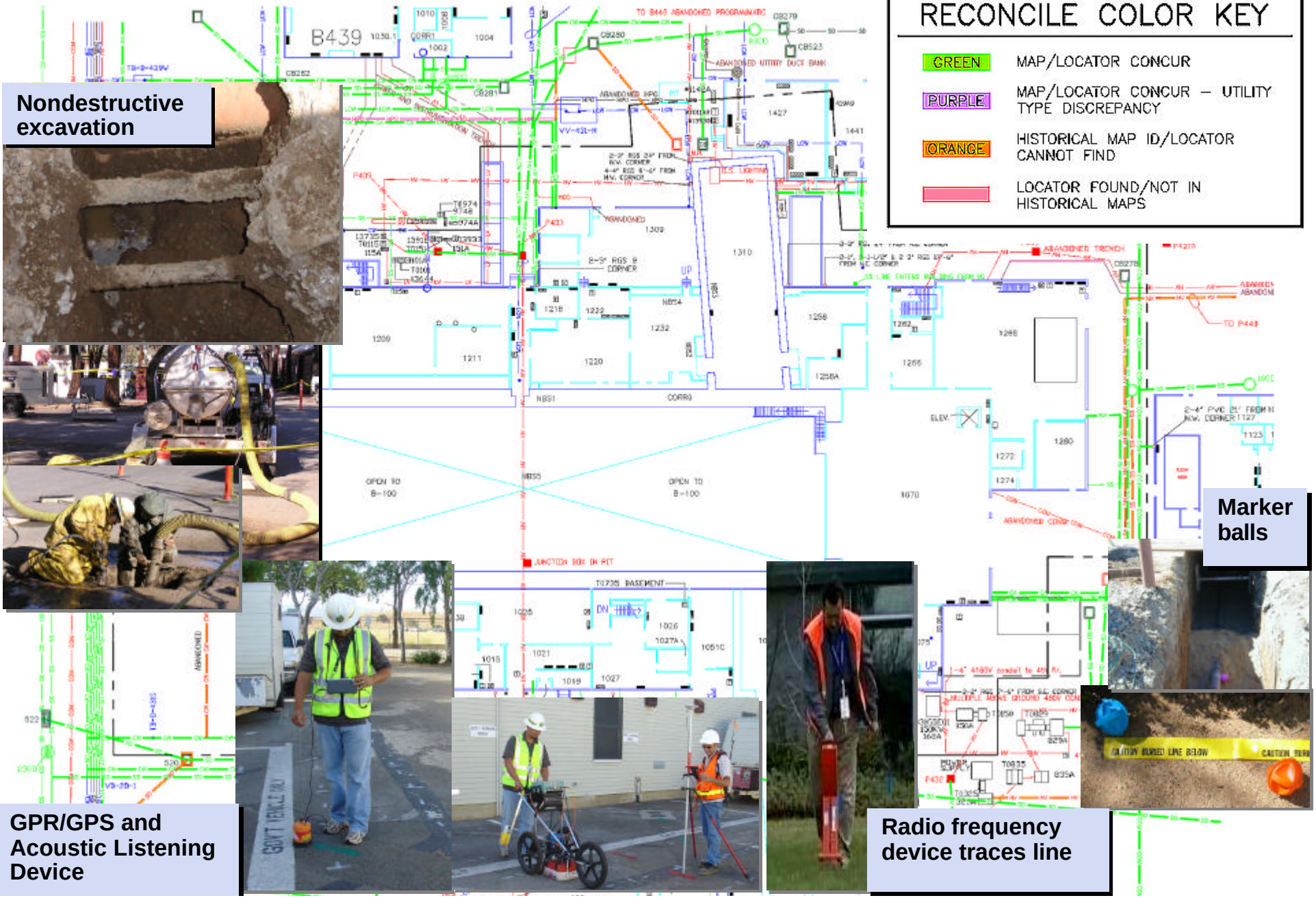
Plan updated as risk factors retired.

Environmental, Safety and Health

- **Environmental, Safety and Health incorporated into the planning**
- **Historical operational background reviews and surveys to determine likely hazards and contamination levels**
- **NEPA review performed and the project granted a categorically exclusion**
- **NHPA review performed and the building determined to be of no historical significance to the State of California.**
- **Confirmatory sampling performed for ACM in order to better bound the scope of abatement**
- **Integrated Safety Management System – DOE Seven Guiding Principles and Five Core Functions**
  - **Integrated Worksheet (IWS) defining scope, hazards, controls, training and authorizing the work**
  - **Subcontractor Site specific Health & Safety Plan and Corporate Injury & Illness Prevention Program**

Continuous safety oversight and managed review of concerns.

Utility safety is best served by integrating historical information and active measurements



Color Coding Best Practice

Problem: Decommissioning systems containing stored energy or contaminants is a communication challenge. Tracking materials from sample through resolution, protective of workers and the environment requires constant verification and documentation to properly control through release.

Solution: SAT uses a color code to identify the status of all Structures, Sub-systems, and Components (SSCs) during decommissioning through disposition.

Red: Known hazard exists on or inside a SSC.

Yellow: SSCs denoting caution.

Blue: Controlled disposal to the Municipal Landfill

Green: Free release - no issue.

Black: Editorials and instructions

Field Execution

- **Completed**
  - **Deactivation and reroute of utilities**
  - **Interior abatement**
  - **Demolition of 8,000 SF**

Field Execution

Field Execution

- **Working**
  - — **Abatement/removal of Galbestos siding**
  - — **Structural demo**
  - — **Specs for Restoration design-build**

Restoration planning for Design-build

D&D best practices

- Single program supports S&M and D&D
- Resourced schedule tracks performance
- Design-demo acquisition achieved best schedule/ cost
- Integrated Project Team eliminates surprises
- Environment, Safety & Health team participation
- Comprehensive UG utility location - ZERO hits
- Color coding of systems clearly communicates hazards

Embracing best practices sustains team performance and achieves mission success.